

Pollution Control and Other Measures to Protect Biodiversity in Lake Tanganyika
(RAF/92/G32)

Special Studies: 'Pollution of International Waters', 'Sediment Discharge and its
Consequences' and Related Biodiversity Studies

Back-to-Office Report on Visit to Lake Tanganyika, 12 September to 4 October, 1997

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1. Introduction

The principal aim of the visit detailed below was to act as Project Technical Adviser to the Special Study 'Sediment Discharge and its Consequences', participating in the preparation and delivery of lectures, seminars, practical and field instruction at the Field and Laboratory Training Workshop, held in the premises of TAFIRI, Kigoma, Tanzania, 22 September to 3 October, 1997. The workshop was inter-disciplinary in nature, incorporating the three Special Studies: 'sediments', 'pollution' and 'biodiversity'.

2. Summary of Principal Activities

Friday 12 September

Arrive in Dar es Salaam in company of Chris Foxall (University of East Anglia) and Alex Kirika (IFE, Penicuik).

Saturday 13-Sunday 14 September

Discussion meetings with Chris Foxall (CF), overall co-ordinator of the workshop and Technical Adviser to the pollution special study and Alex Kirika (AK), also of the pollution special study, on the format of the workshop and the integration of the three special studies components.

Monday 15 September

Flight from Dar es Salaam to Kigoma. Afternoon orientation meetings with Ken Irvine (KI), also working on the sediments special study, and Catherine O'Reilly (CO'R), Ph.D. student supported by the sediments special study.

Tuesday 16 September

Day spent with CF and AK tidying and cleaning out the 'dry' and 'wet' labs at TAFIRI, including covering the new benches with "bench-coat", in preparation for the workshop.

Wednesday 17 September

Morning meeting with KI to discuss collaboration between sediments and biodiversity studies at various sites in Zambia and Tanzania. Draft proposals for collaboration formulated. Afternoon - equipment for use in sediments laboratory work unpacked and sorted in preparation for practical work.

Thursday 18 September-Sunday 21 September

Beach and offshore sediment samples collected from various sites in Kigoma Bay including close to TAFIRI with the aim of having material ready for description and analysis at the workshop prior to the participants collecting their own samples. Continuation of laboratory preparations prior to workshop. Meetings with Kelly West (KW), Graeme Patterson (GP), Tony Bailey Watts (TBW), Eddie Allison (EA) and CF on various aspects of the project including discussions on, (i) allocation of the workshop participants to the various special study groups and (ii) allocation of resources for workshop (lab space, boats etc.). Final preparations of lecture materials for workshop - slides, handouts etc.

Monday 22 September

Day 1 of Workshop. Presented two talks to all participants on: 1. Lake Tanganyika: origins, geology and physical characteristics, and 2. An introduction to the Special Study: "Sediment Discharge and its Consequences". Initial meeting with sediments group participants.

Tuesday 23 September

Day 2 of Workshop. Series of presentations given to sediments group on 'fundamental properties of sediments' as precursor to practical work. Meeting with KW, EA, TBW and CF to discuss preparation of "handbooks" of techniques for the various study groups - 'towards a training manual'. Meeting with GP and Dr Hudson Nkotagu (HN), Department of Geology, University of Dar es Salaam, to consider work programme for MSc hydrogeological study to be undertaken by Mr CELR Rubabwa (CELR), Kigoma Regional Water Department, participating in the workshop in the sediments group.

Wednesday 24 September

Day 3 of Workshop. Lead two trips onto the lake for, all participants, aboard the *Echo* to demonstrate position fixing using a 1:50 000 scale map and GPS for the purposes of determining water sampling (AK) and sediment sampling (KI) sites. Further meeting with GP and HN to consider work programme for CELR. Further meeting with KI to discuss collaborative sampling programmes in Zambia (off mouth of Lufubu River) and Tanzania (Malagarsi or Luiche deltas).

Thursday 25 September

Day 4 of Workshop. Lecture given to all participants on "Sediments and Biodiversity". Continuation of talks on fundamental properties of sediments to sediments group. Practical instruction given on sieving of sediment samples. Attended (with KI and HN) meeting, co-ordinated by GP, to consider various aspects of the subdivision of the work/research proposals in the sediments special study.

These include: river (sediment source) monitoring, land use (remote sensing), palaeolimnology (fundamental changes over the last c.300 years), sediment types and distributions, invertebrate organisms (their distribution in relation to sediment type), nutrients (suspended sediment interaction with nutrients), catchment hydrology, primary production (its relation to sediment type) and limnology (mechanisms of river water inflow etc.).

Friday 26 September

Day 5 of Workshop. Day spent with sediments group participants working on analytical methods, laboratory practices and data plotting techniques. Meeting with GP, KW and KI to discuss workplans for sediments special study including possibility of appointing a post-doctoral scientist to co-ordinate work in Zambia and Tanzania. Attended meeting, co-ordinated by John Rutter (JR), NRI, to discuss GIS and data integration options for the Lake Tanganyika project (details given in Appendix 1 of Visit Report VS 4879 by John Rutter).

Saturday 27 September

Day 6 of Workshop. Sediments group led on local beach sampling programme in Kigoma Bay. Field use of laminated grain size scale demonstrated. Seminar discussion held on the construction of a field data form - what information should be included etc. Meeting with GP, KI and KW to discuss issues relating the timescale of operation of the forthcoming cruise on the Explorer, post-doctoral links between sediments and biodiversity studies and the possible value of using side-scan sonar for sediment and habitat mapping within the project (see below).

Sunday 28 September

'Free day' for participants. Initial appraisal of archive data on water and sediment discharge data for rivers of the Kigoma Region, gathered during the NORAD (Norwegian Agency for International Development) programme and collated in the Kigoma Water Master Plan (1982). Attended second GIS meeting, co-ordinated by JR, to discuss GIS and database options for the Lake Tanganyika Project (details given in Appendix 2 of Visit Report VS 4879 by John Rutter).

Monday 29 September.

Day 7 of Workshop. Continuation of appraisal of NORAD data (clear indication gained that there are more data on suspended sediment transport by the Luiche River than the Malagarasi). Continuation of beach and nearshore sediment sampling. Meeting with TBW to discuss relationships between substrate types and microscopic biodiversity (especially algae).

Tuesday 30 September.

Day 8 of Workshop. Lecture given to sediments group on 'sediment composition', detailing simple ways that grains of differing compositions/mineralogies may be identified in the field and in the laboratory. Sediments group given the task to design a field sampling and subsequent analytical programme aimed at answering the question, "is there an up-beach - down-beach variation in sediment grain size at the beach at

TAFIRI?" Final version of field data form produced. Meeting with GP and CO'R to consider field sampling sites. Visit, with GP, HN and Theodore Mpyalimi (one of the workshop participants), Kigoma Regional Water Department, to the lowermost gauging station on the River Luiche (4A9), near Simbo with the aim of considering the possibility of its reinstatement by the project. Attended meeting of all consultants to discuss the 'where', 'when' and 'how' of sampling for the various study groups. Several key sites, where all the special study groups can collect samples and work together, were identified (see below).

Wednesday 1 October.

Day 9 of Workshop. Supervised full day of laboratory analyses by sediments group including further sieving, determination of calcium carbonate content of samples, quantification of grain shape and sorting etc. Meeting with CF and HN to discuss potential use of isotopes in environmental monitoring within the project.

Thursday 2 October

Day 10 (final day) of Workshop. Sediments group made preparations for presentations to be given later in the day. Presentation given by two speakers from the sediments group: CELR and Robert Sinyinza (Department of Fisheries, Mpulungu, Zambia).

Friday 3 - Saturday 4 October

Flights Kigoma to Dar es Salaam, Dar es Salaam to Amsterdam, Amsterdam to Edinburgh.

3. Conclusions and Recommendations

- From my point of view as the principal 'deliverer' of material at the Workshop to the sediments group, the Workshop was a success. Time will tell if this perception is held by the participants. It was also a learning experience for me. For example, it proved necessary to reduce the amount of material which I had initially intended to include in order to ensure that a few techniques were known in some degree of depth by the participants rather than many techniques were known only superficially.
- Appendix 1 of this report lists a [confidential] summary, based on my perceptions, of the abilities and motivation of the participants of the sediments group as observed during the Workshop.
- When identifying key sites at which the special study groups can integrate their efforts, it is important that at least some of these should be within easy reach of the various stations, e.g. Kigoma Bay. The Luiche delta is seen as a good site at which to initiate sediments work (see below). Archive data (NORAD, see above) exist for suspended sediment discharge. RWD, GP and KI need to discuss the

best way forward to get this work off the ground speedily and the likely involvement of TAFIRI staff.

- Once the Mpulungu laboratory is fitted out, sediment studies will be able to commence. KI has identified the mouth of the Lufubu River as an excellent site (and one which will form an important comparison with the Luiche) together with other possible sites such as the Kalambo River. The Zambian team in the sediments group should be in a position to start sampling and analysis programmes with only a small amount of further help. RWD, GP and KI should liaise further on the Zambian sampling programmes.
- Initial thoughts were that the Malagarasi delta would provide a good comparator with the mouth of the Lufubu River. However, it is now believed that the Malagarasi is too large and geologically complex to tackle (at this stage) and that the Luiche would provide a more manageable option for which archive data are available.
- There is still a need to address the question of the analysis of archive data on river and sediment discharges. These include data for the former Belgian Congo (and possibly Burundi), held in Tervuren, Belgium. EA has expressed interest in these data from the biodiversity group, RWD to discuss with EA.
- The need to appoint a (biologist-sedimentologist) post-doctoral scientist to 'oversee' the activities of the sediment special study in Tanzania and Zambia have been highlighted during various discussions. It is suggested that this should proceed as soon as possible once appropriate clearance (UNOPS and NRI) has been given (GP to activate) and that a further meeting of GP, KI and RWD may be needed.
- The use of side-scan sonar to aid in the mapping of sediment and habitat distributions in the nearshore, relatively shallow waters of the lake was discussed at several meetings. This might possibly form part of the remote sensing component of the project (see also Visit Report VS 4879 by John Rutter) It is suggested that this could offer a resource to all the special study groups RWD is keen to promote and pursue this and will prepare a 'concept note' on the topic for GP to consider.